GRASSLANDS PROJECT

This project has a primary purpose of reducing the total quantity of salt and selenium being discharged to the San Joaquin River by a group of drainage/water districts in the Grasslands subarea. The participants include Broadview Water District, Charleston Drainage District, Firebaugh Canal Water District, Pacheco Water District, Panoche Drainage District, Widren Water District and Camp 13 Drainers, which include approximately 97,000 acres (39,300 ha). The total tiled area is 48,254 acres of which 37,954 acres is tiled into the Grasslands bypass project. Summers Engineering has established that historical drainage from the area was 57,000 acre-feet per year (Grasslands Bypass, 2001).

In March 1996 this group entered into an agreement to use a portion of the San Luis Drain (SLD) to bypass sensitive wildfowl areas that had previously been utilized for drainage water discharge. As a portion of this agreement the users agreed to monthly and yearly load limits on selenium being discharged through the SLD. On July 24, 1998 the Regional Board adopted a control plan and issued waste discharge requirements, including selenium load limits. The Grasslands users have implemented a variety of practices to reduce the total quantity of salt and selenium. Some of these practices are: formation of a regional drainage entity, newsletters and addition communications with the growers (primarily from the aspect or reducing the quantity of applied irrigation water), a monitoring program, blending of some drainage water back into irrigation water supplies in all member districts, and an active land management program to utilize subsurface drainage on salt tolerant crops.

From the perspective of drainage water reuse only the "blending" and the "active land management" are actual reuse projects. It should be noted that the monitoring and source reduction aspects of the program have been successful and have contributed greatly to reducing the quantity of drainage water from the area. In the 1999 water year drainage volume had been reduced by 39% over the pre-project levels of 1996. It should be noted that the 1999 water year had significantly less rainfall in the area than the 1997 and 1998 water years during which the Grasslands participants were unable to meet the salt and selenium discharge requirements. Each individual drainage district manages the blending program. Some districts, such as Panoche, have made agreements with their growers that the blended irrigation water will not exceed 600-ppm total dissolved solids (TDS). Others have agreed to 800 or 900 ppm limits. Broadview Water District has a long history of blending some drainage water into their irrigation water supplies (Wichlens et al. 1988a).

A major problem of blending brought to the attention of this writer is the fact that the high quality water and the drainage water have significantly different densities and will not mix well unless agitated. The story is told of one grower near the blending point in the ditch who essentially burned up his tomato crop by applying unmixed irrigation water to his field. His headgate took the water from the bottom of the ditch, thus providing mainly the higher density drainage water. Firebaugh has learned that agitation

of the water to make certain it is well "blended" is an important aspect of the program (Jeff Bryant, personal communication).

For the water year 1999, 7,903 acre-feet of drainage water was blended back into the irrigation water system. Summers Engineering reports that this is near the ultimate goal based upon the limitation of blended water quality. Firebaugh recycles 24 of 34 sumps. It should be noted that the TDS of the drainage water blended back into the system is 6.0 dS/m that is slightly higher than the average salt concentration in the area's drainage water. The reason for this is that the sumps with the highest concentrations were selected for "blending".

The active land management (ALM) portion of the project is the most extensive drainage water reuse program currently in progress in the SJV. Each member district apparently has some water reuse project as a portion of the overall plan, but the main project is in Panoche where ultimately 3852 acres of cropland has been set aside as the district reuse facility. When completely built, this area will receive 12,000 acre-feet of drainage water, approximately 3.25 ft per acre.

Bermuda grass was being irrigated strictly with 100% drainage water 4.5 dS/m. Salt tolerant alfalfa and Sudan grass were irrigated with a blend of drainage water 4.5 dS/m and well water 1.5dS/m. The district attempts to keep the blended mixture in the 2.0 –2.2 dS/m range. (Personal Communication, July 2000).

Summers Engineering has reported that at the end of water year 2000, 1123 acres had been planted as follows: 530 acres pasture mix; 471 acres alfalfa; 133 acres alfalfa with pasture. At the end of water year 2001, 2141 acres of land will have been planted as follows: 920 acres pasture mix; 471 acres alfalfa; 122 acres alfalfa with pasture; 72 acres alfalfa for seed; 300 acres alfalfa seed with pasture; 220 acres asparagus. They have reported that the newly seeded fields are irrigated with the better quality water until they are established, thus only a small portion of the fields have been irrigated with drainage water as of this writing.

There is no present subsurface drainage system for the land being used. Soppe et al., (2000) report that the area is drained by open earthen ditches, but lacks an outlet due to the landowner's decision not to participate in the Grasslands Bypass project. Summers Engineering reports that "future phases call for the installation of subsurface systems with implementation of treatment and salt disposal components." It is believed that ultimately this will become a regional in-valley disposal system with solar evaporators and salt harvesting.

As of December 2000, a total of 5843 acre-feet (AF) of drainage water had been disposed of at the ALM site during the previous two-year period. This drainage water had contained 845 lbs of selenium and 22.5 tons of salt. The highest three months of drainage water application were June 2000 (458AF), August 1999 (434AF) and August 2000 (400AF). No drainage water was applied to the land in November or December of

either year. The concentration of the drainage water varied between 3.1 and 5.6 dS/m during the 2000 calendar year.

Broadview Water District has obtained land in the lower end of the district. A small portion of this land has been used since October 1998 as flow through channels to remove selenium. Treatment 3 with straw bales planted with saltgrass (*Distichlis spicata*) and rabbitsfoot grass (*Polypogon monospeliensis*) has been successful in removing 73% of the selenium. Data from October 2000 indicated that improvements in the system, high tonnage of straw bales alone, may have raised the removal levels to 84-85%. An added benefit is that nitrate is also nearly 100% removed. The compact nature of the system allows it to be covered with netting to protect wildlife from entering the contaminated water.

A grass plot of Willcox alkali sacaton {*Sporobolus auriudes* (Torr.) Torr}, and a six acre pasture plot of tall fescue (*Festuca arundinacea*), trefoil (*Lotus corniculatus*), clover (*Trifolium fragiferum*), Salado alfalfa {*Medicago sativa* (var. "Salado")} and alkali sacaton were also planted on this site. Both plots have been irrigated with subsurface drainage water from the Broadview district. Cattle (22 in one verbal report) were pastured on the mixed plot in the summer of 2000 and appeared to do well. No data as to weight gain or numbers are available. Broadview is expanding the pasture project, planting poplar, eucalyptus, and Casuarina trees in the spring 2001. Alfalfa plots and native vegetation test plots will be planted in the fall 2001. This will expand the drainage water reuse area to approximately ninety acres.

The written report July 2000 states that Firebaugh Canal Water District has no district wide blending reuse program. Jeff Bryant, manager of the district reported that four or five of sixteen drainage sumps are plumbed back into the irrigation system part of the season and 19 other sumps are recycled at all times. The average salinity of the irrigation water is 0.6 dS/m and the average drainage water is 5.0 dS/m. The main contribution that this district appears to be making is source reduction instead of drainage water reuse. After melon crops, Sudan grass (*Sorghum sudanease*) is planted to take up excess water from the soil profile and the shallow water table. The Sudan grass is planted in June after the melon harvest, cut in July and then pastured with sheep in September. Safflower is also used for this purpose during the winter months.

Bryant also reported that some growers planted trees in the district that were irrigated with drainage water, but all of these have died or were sprayed. Some growers are also planting forages for irrigation with drainage water, but this is on an individual basis. (Jeff Bryant, 2000, personal communication)

In general, all of these projects have begun only recently and are now just getting totally installed. At the present time, because of discharge limitations placed on the project, the intent is to dispose of drainwater and not discharge to the San Joaquin River. There is, however, a comprehensive In-valley planning effort underway through cooperation with the Department of Water Resources and the U.S. Bureau of Reclamation to analyze impacts of the drainwater use on the 4000 acre In-valley disposal

area and to plan for future phases to maintain the long-term ability to dispose of drainwater.

In summary, originally 57,000 acre-feet of drainage were discharged from the area. By the end of the 2000 water year the discharge to the river had been reduced by 41%. Approximately, 8000 acre feet had been blended back into the irrigation system and 2300 acre-feet reused on salt tolerant crops. The difference should be an indication of source reduction, around 13,000 acre-feet. When fully operational the goal appears to be 0.385 x 57,000acre-ft = 22,000 acre-ft discharged to river; 0.315 x 57,000 acre-ft = 18,000+ acre-ft reused or treated; 0.30 x 57,000 acre-ft = 17,000 acre-ft source reduction or conservation. Ultimately improvements in drainage water reuse and source reduction will decrease the quantity discharged to the river, thus reducing the quantities of salt, selenium and boron entering the river system. Treatment systems, such as the one at Broadview may reduce the need to discharge selenium and even reduce the quantity of nitrates entering the SJR.

It is too early to evaluate the total success or failure of these systems, but the group has been meeting the river discharge goals that were set in 1996 and has established positive goals for the future.